

## Chapter IV – Rail Transportation



## Rail Transportation Overview

- Customers receive service via a company rail siding or must have access to a rail transfer facility such as an intermodal terminal or a bulk transload facility
- Freight railroads account for a large portion of U.S. freight transportation
  - More than 40% of the nation's intercity ton miles
  - 11% of the the nation's freight bill
  - 70% of vehicles from domestic manufacturers
  - 64% of the nation's coal
  - 40% of the nation's grain
- Freight railroads are mostly privately owned and financed
- The industry is highly capital intensive
  - High barriers to entry
  - High fixed costs relative to variable costs

## Railroad Development

Railroads were developed in the 1800s and early 1900s

- Approximately 30,000 miles of railroad line were constructed prior to the Civil War
- Following the war many thousands of miles were built, much of them in the west
- The first transcontinental railroad was completed in 1869
- The peak in railroad building came in the 1880s when over 70,000 miles were constructed
- The expansion period was practically over by 1916 when the railroad mileage in the United States was 254,037

Railroads dominated intercity freight transportation through World War II

- Market dominance and monopoly practices by railroads resulted in a series of regulatory laws being passed between 1877 and 1920
- From that time and during the depression, market share remained high but financial performance declined
- Railroads survived because of continued high large demand for transportation services and because of public sector promotional activity during World War I and World War II

## By 1970, a heavy regulatory burden had the industry on the brink of ruin

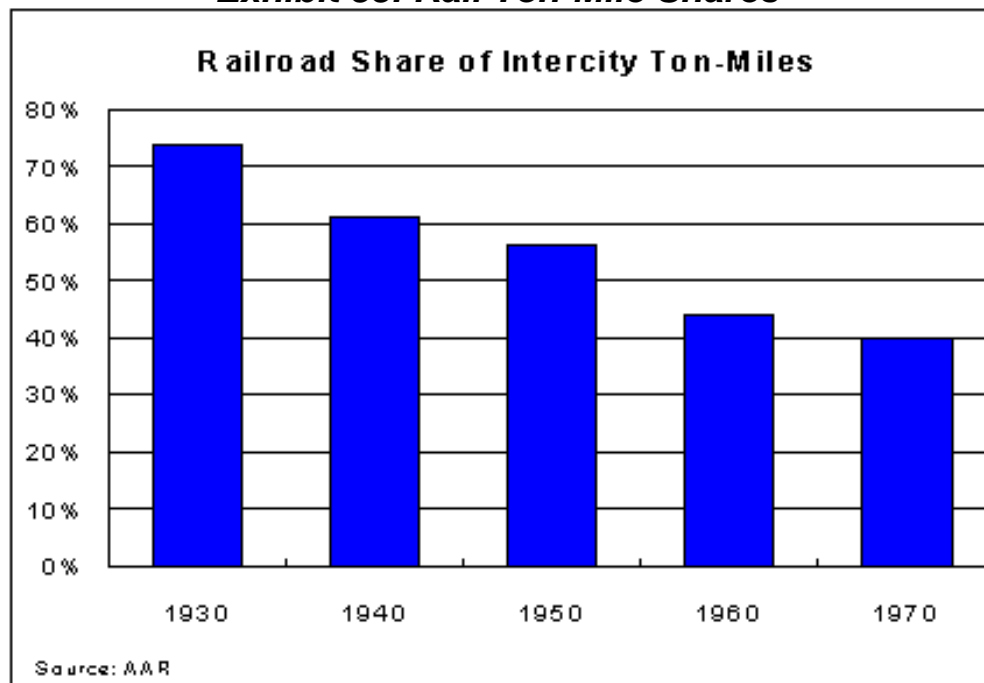
Increasing modal competition, predominately from trucks and barges as the federal highway system and interstate waterway system were expanded at federal expense post World War II

Extensive rate and service regulation, where rail rates in many cases bore no relation to the underlying cost structure of providing rail service

Railroads were prohibited from adjusting their physical plant to meet the needs of the changing transportation marketplace

Railroad market share dropped nearly in half

**Exhibit 33: Rail Ton-Mile Shares**



## The Staggers Act saved the industry

Congress intervened with the passage of the Staggers Rail Act Of 1980

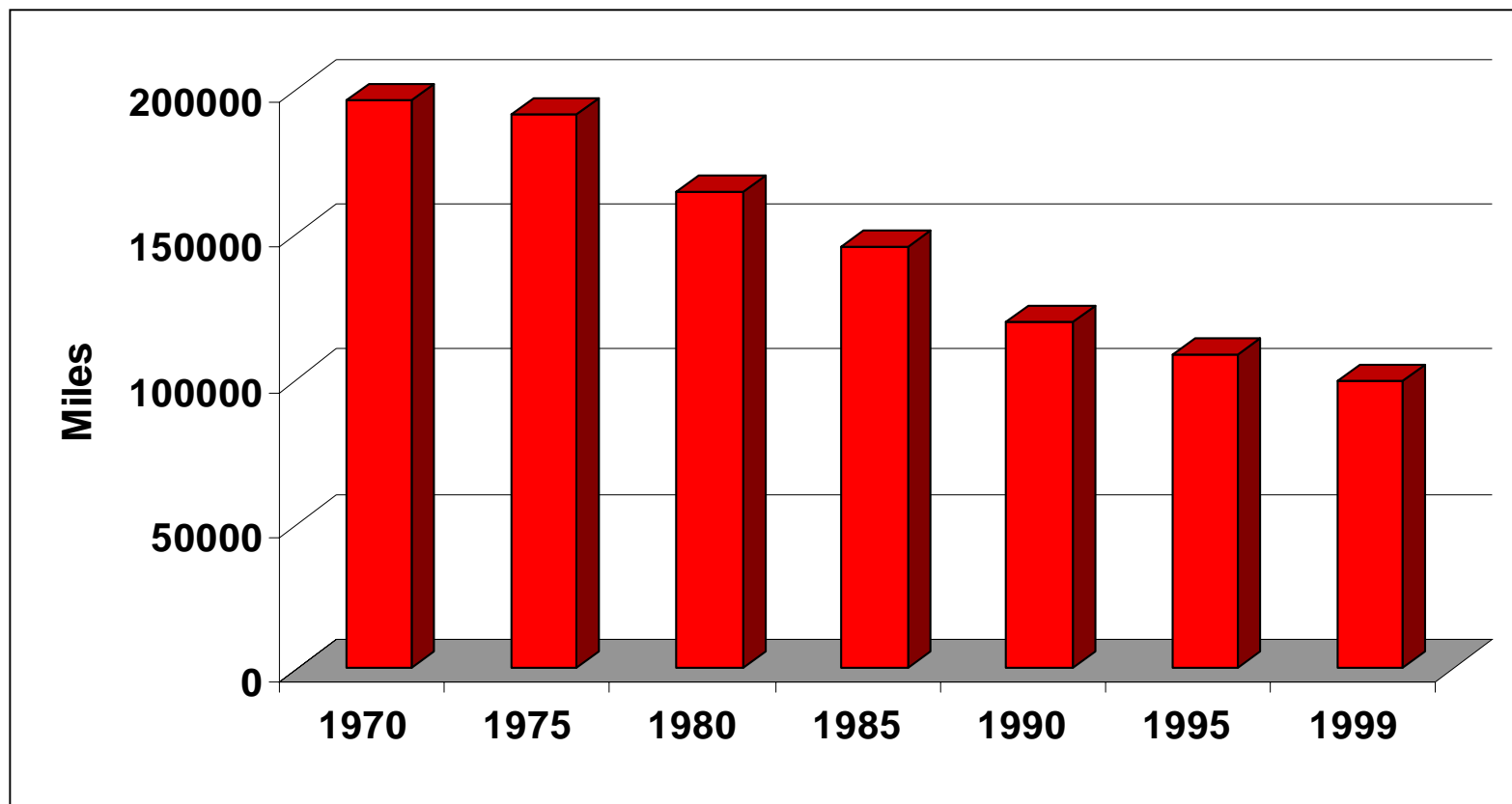
- Railroads were allowed to set their own rates in response to competition in the transportation marketplace where such competition existed
- Railroads were able to differentiate their pricing and service structure on competing routes in response to demand in each traffic lane
- Railroads were permitted to enter into confidential contracts specifying price and service levels
- The process whereby railroads were allowed to abandon or sell under-performing or unutilized rail lines was streamlined
- Slow market share recovery up until 1996
- Improving, although still not impressive, profitability and rates of return in the industry
- According to the Association of American Railroads the industry Return on Investment (ROI) increased from 2% in the 1970's to 7% in the 1990's

## **Staggers plus new technology resulted in major changes in the rail industry**

- Line rationalization resulted in the elimination of inefficient routes, strengthening efficient route structures and driving down costs
  - Plummeting rail rates (down 57% in real terms 1981-1998, per AAR)
  - Significant and continuing gains in railroad productivity
  - The remaining publicly held railroads in North America were privatized
  - Short line and regional railroads proliferated
  - Consolidation among the large railroads accelerated into the late 1990's

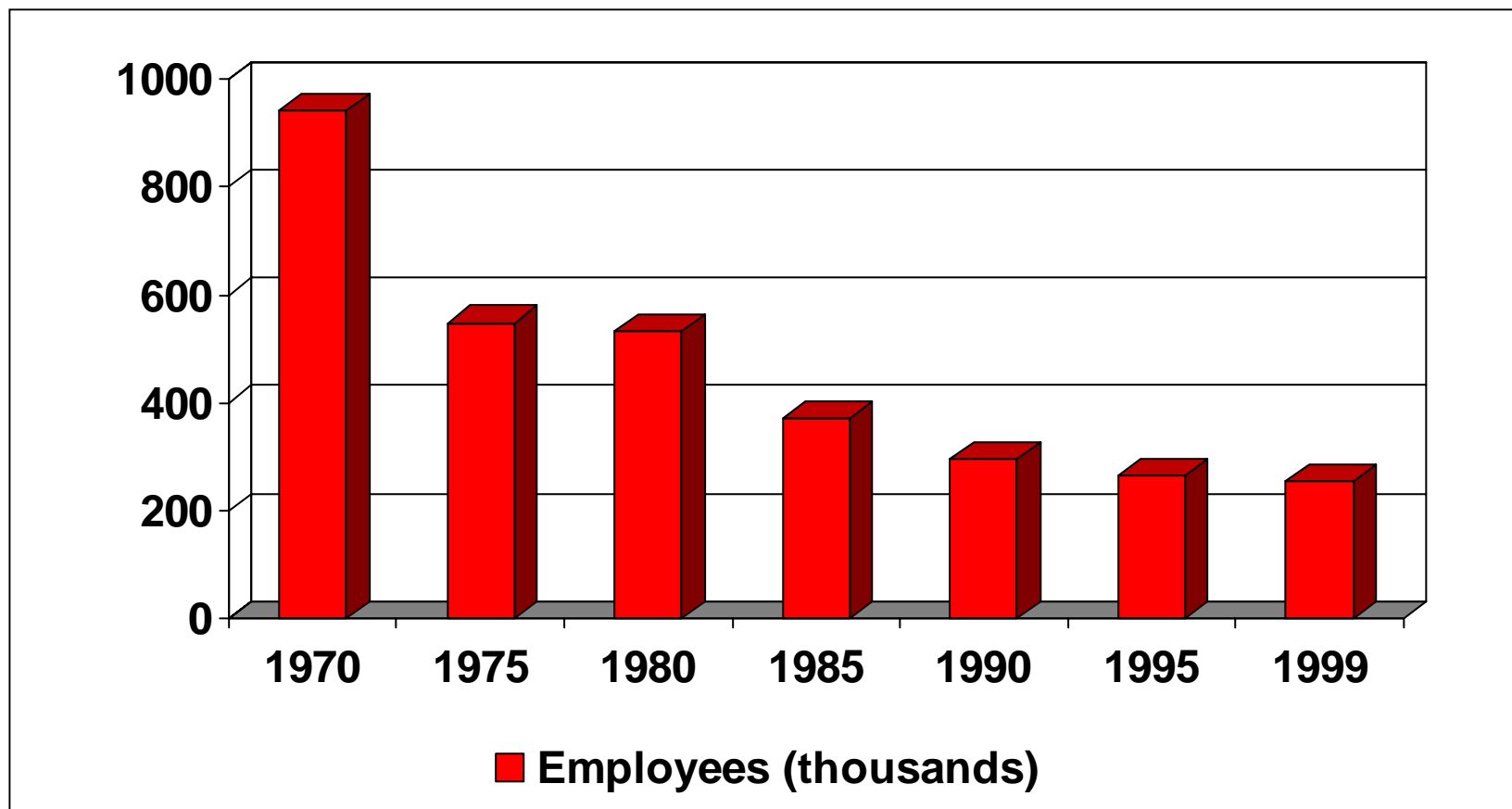
## Class I rail mileage has declined

*Exhibit 34: Class I Rail Mileage*



## Employment has declined dramatically

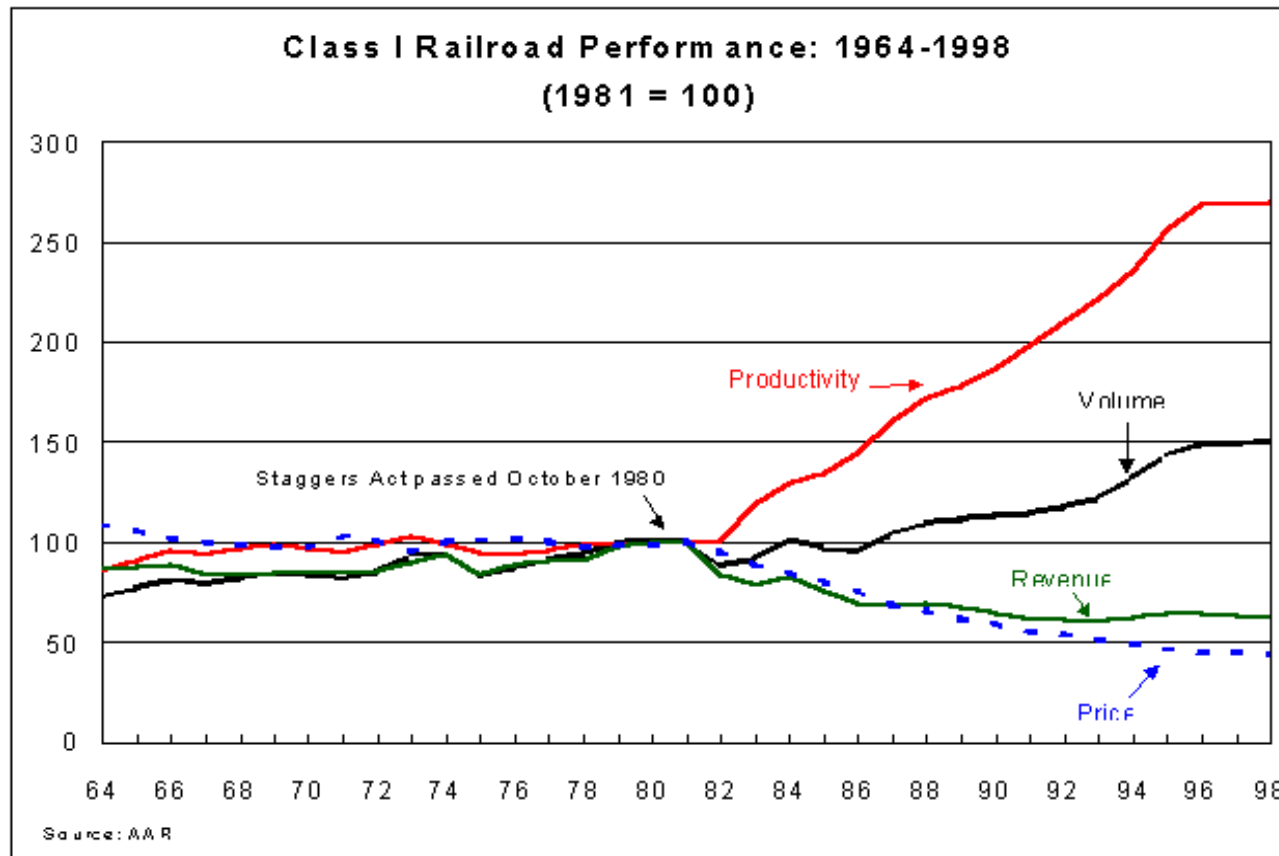
*Exhibit 35: US Railroad Employment*





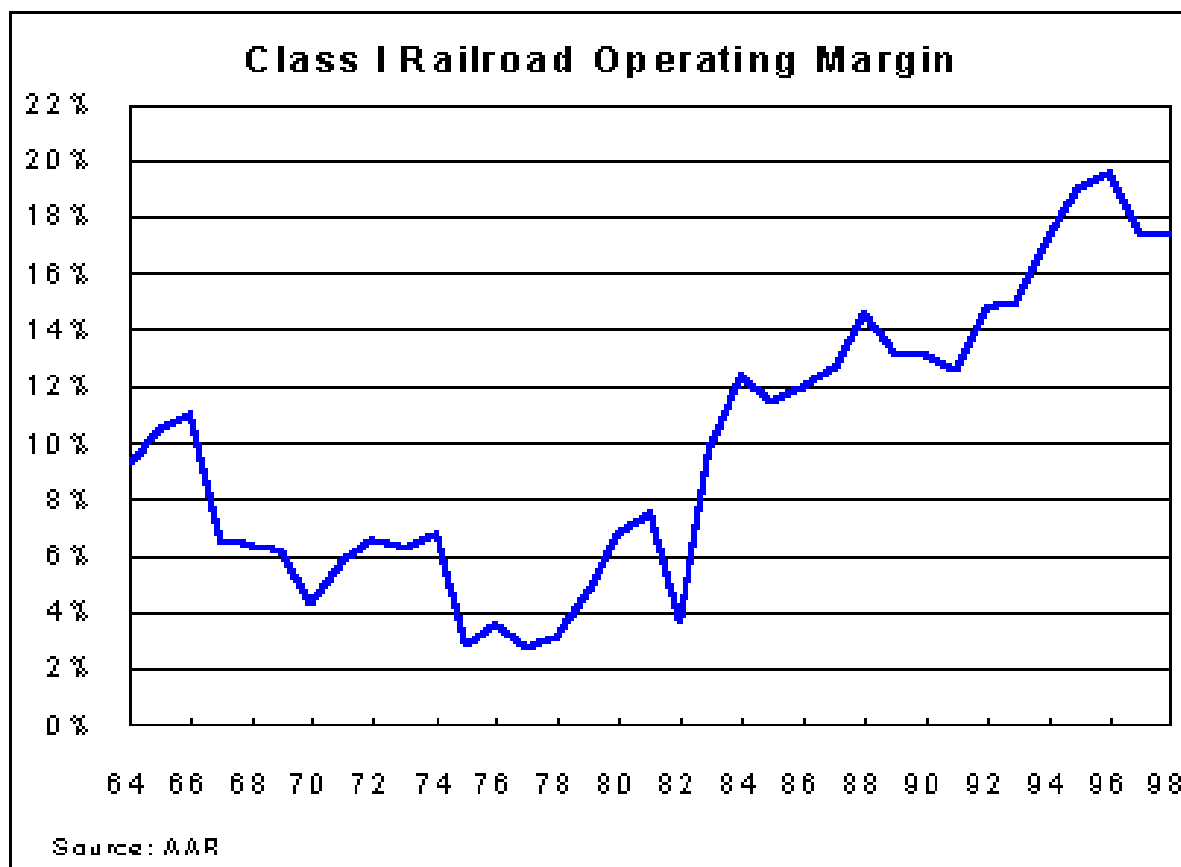
## Performance has improved

**Exhibit 36: Rail Industry Performance Measures**



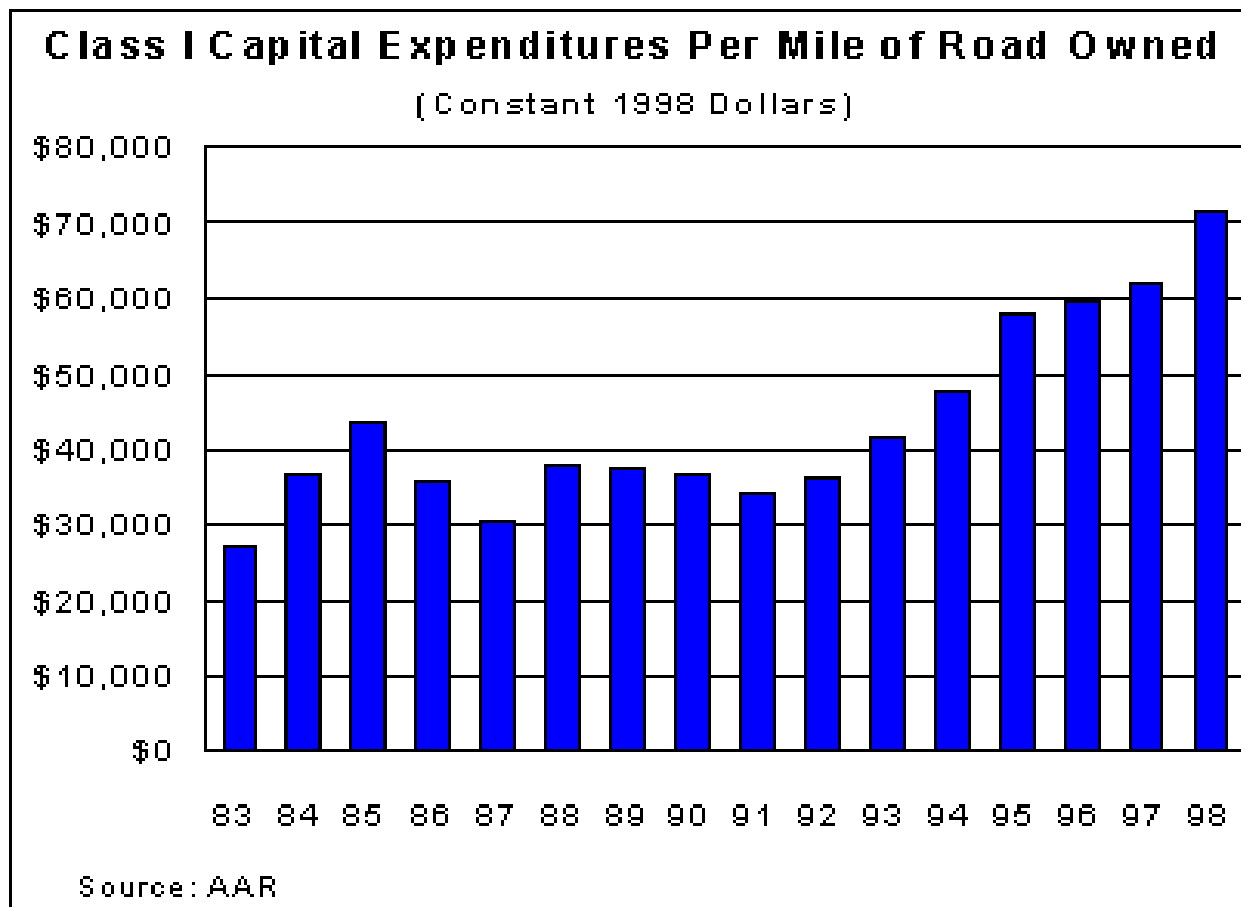
## Operating margins have increased

**Exhibit 37: Class I Railroad Operating Margin**



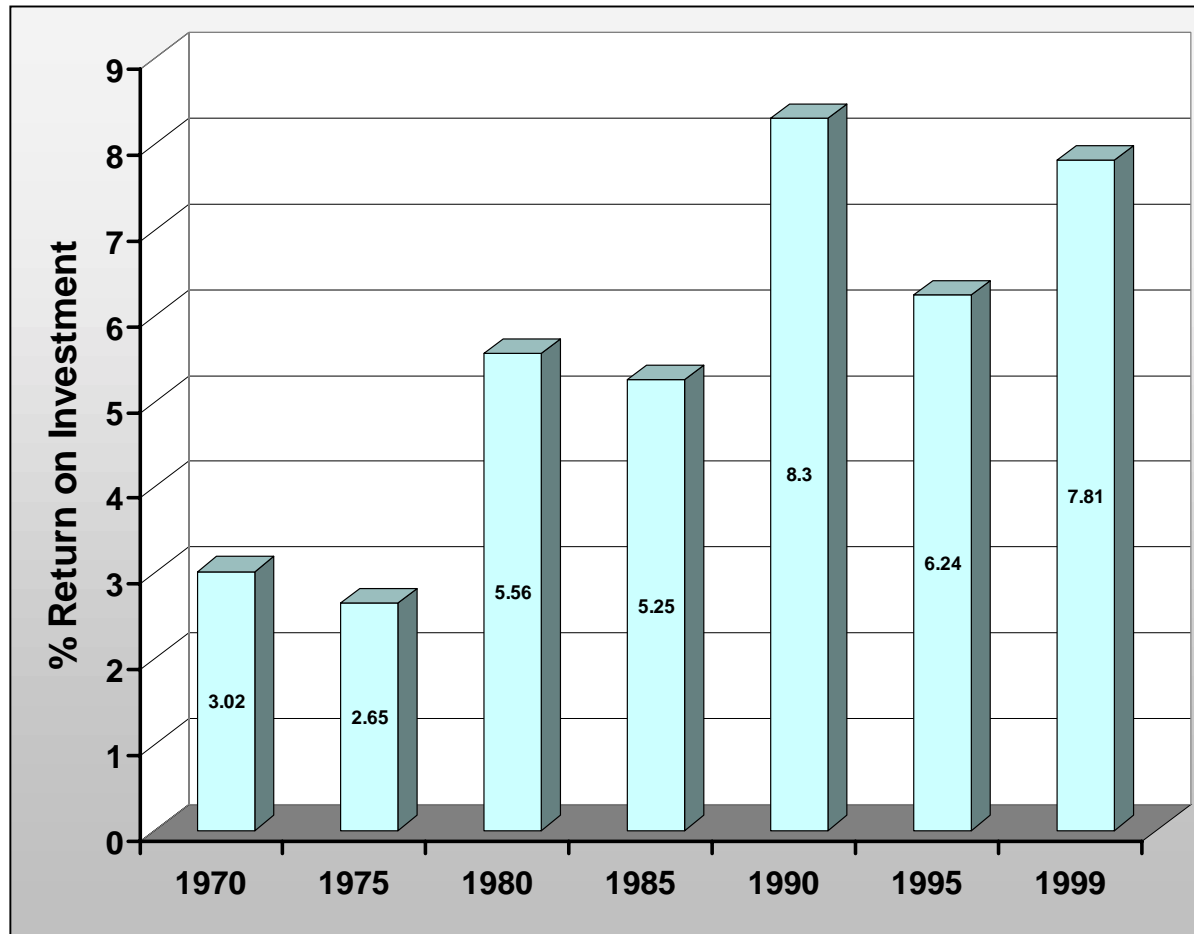
## Unit capital investment increased

**Exhibit 38: Rail Industry Capital Expenditures**



## Financial returns have improved

***Exhibit 39: Railroad Industry Financial Returns***



## Structural Changes

Publicly held North American railroads have been privatized

- Conrail returned to profitability following Staggers and was privatized in 1987
- Canadian National was privatized in the early 1990s and is now one of the most efficient railways on the continent
- Mexican Railway was divided into five concessions that were auctioned in the late 1990s

Small railroad companies have grown in importance

- The number of Class II and Class III railroads has grown to over 500 firms
- \$ 3 Billion in revenue from 11 million carloads
- 29% of the track miles, or about 49,600 miles of track
- smaller railroads are able to offer custom service at lower cost because of lower overhead and often non union employees

Large railroads have continued to pursue consolidation

- Mergers have produced favorable economics – reducing rail costs relative to trucks
- But, service problems resulting from the restructuring is putting downward pressure on rail market share

## Rail Tonnage is dominated by a few major bulk commodities

*Exhibit 40: 1999 Rail Tonnage By Major Commodity Group*

<b>1</b>	<b>Coal</b>	<b>751 Million Tons</b>
<b>2</b>	<b>Chemicals</b>	<b>154 Million Tons</b>
<b>3</b>	<b>Farm Products</b>	<b>139 Million Tons</b>
<b>4</b>	<b>Nonmetallic Minerals</b>	<b>125 Million Tons</b>
<b>5</b>	<b>Intermodal</b>	<b>96 Million Tons</b>
<b>6</b>	<b>Food Products</b>	<b>92 Million Tons</b>
<b>7</b>	<b>Primary Metal Products</b>	<b>56 Million Tons</b>
<b>8</b>	<b>Lumber and Wood Products</b>	<b>50 Million Tons</b>
<b>9</b>	<b>All Other</b>	<b>305 Million Tons</b>

## Coal is the largest revenue source, followed by intermodal

*Exhibit 41: 1999 Rail Traffic By Major Commodity Group*

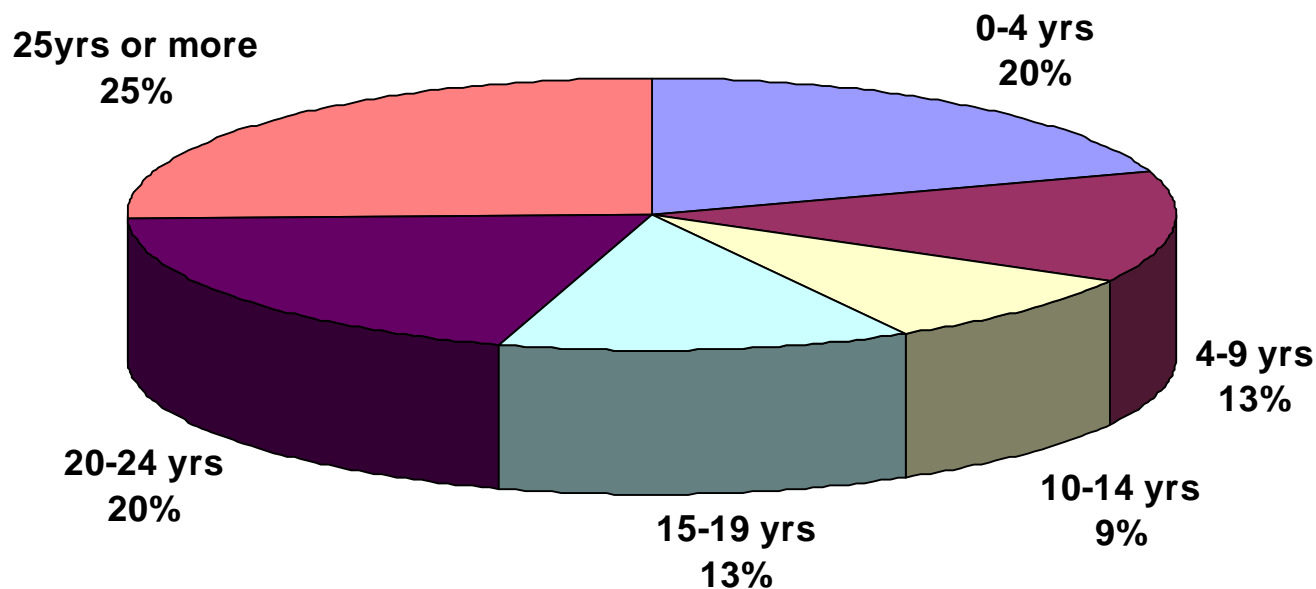
1	Coal	\$7.7 Billion
2	Intermodal	\$4.7 Billion
3	Chemicals	\$4.6 Billion
4	Transportation Equipment	\$3.6 Billion
5	Farm Products	\$2.7 Billion
6	Food Products	\$2.4 Billion
7	Lumber and Wood Products	\$1.5 Billion
8	Pulp and Paper Products	\$1.5 Billion
9	All Other	\$6.7 Billion

## Locomotive fleet age is declining

Locomotives can easily last for 30 years with periodic rebuilding

Aggressive ordering of new locomotives in recent years has resulted in a relatively new fleet

***Exhibit 42: Locomotive Fleet Age Distribution 1999***





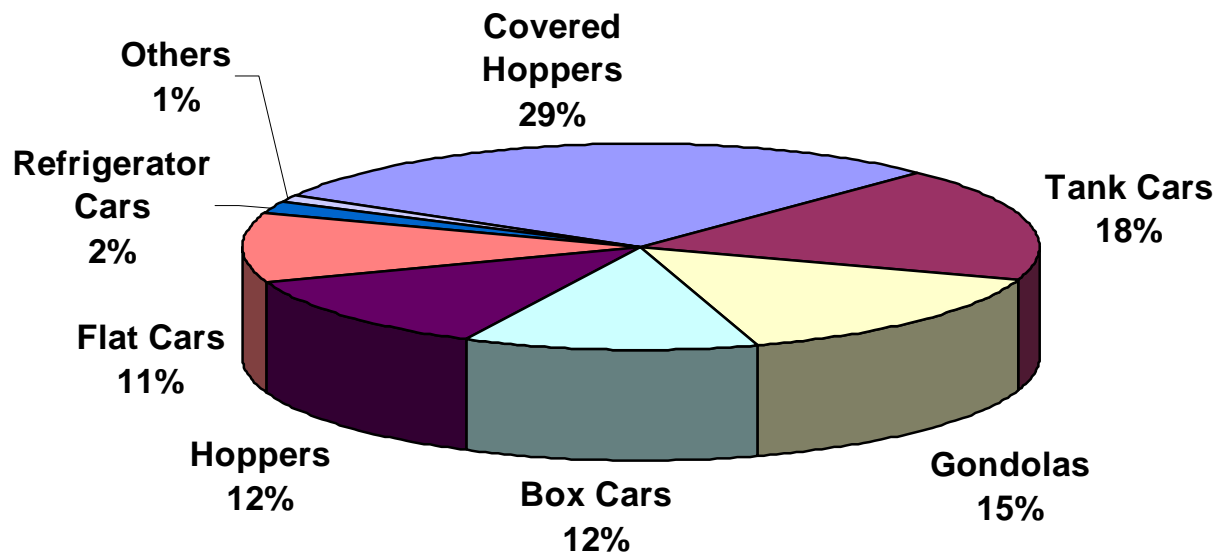
## Types of Freight Cars

The railroad industry as a whole uses over 1.3 million freight cars

The fleet is heavily weighted toward specialized cars for bulk commodities: hoppers and gondolas for coal, tank cars and cover hoppers for chemicals, covered hoppers for grain, etc.

Many specialized types, notably tank cars, are owned and supplied primarily by customers or leasing companies

***Exhibit 43: Freight Car Types***



## Rail carload service profile

Traditional freight trains made up of individual cars

Unit trains made up of identical cars carrying a single commodity

- Shipments may be one car or several
- Local trains pick up the cars from a company rail siding
- Local trains deliver the cars to rail classification yards which build intercity trains
- Intercity trains deliver the cars to the classification yard in the destination city and the process is repeated in reverse for the delivery



## Rail Carload Service

Rail carload customers typically are moving low value, bulk commodities

- Less than unit train volumes moving between a variety of origin and destination pairs
- Low value commodities
- Low transportation cost is more important than transit time or predictability
- Long distance movements (1000+ miles) which favor rail economics over truck

Rail Access is Not Automatic

- Customers ordinarily receive service via a company rail siding
- Alternatively a customer might have access to a rail transfer or bulk “transload” facility
- Rail intermodal service requires economical trucking to a nearby rail intermodal terminal (“ramp”)

## Truck-Rail Transload Service Profile

Rail cars may be loaded at a production plant, rail siding, or a transfer terminal

- Example: autos moving from a production facility to a terminal in major metropolitan market
- Example: flour being transferred from rail to truck by conveyor

Trucks deliver cargo to the customers

- Example: autos moving from terminal to dealers
- Example: flour moving from the terminal to a bakery

Transload Facility and Commodity Types

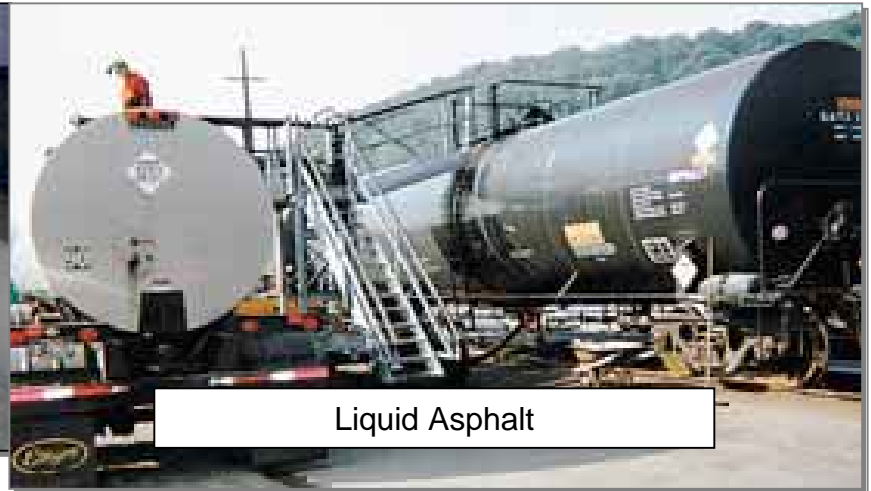
- Commodities are diverse but have a common characteristic: the use of efficient handling equipment to transfer between rail and truck.
- The commodities generally unload from rail into either storage or onto a truck, but they can load from truck to railcar for outbound movement
- Some sites, particularly those concentrating on a single commodity, can occupy a large area and have as many as 75-100 loaded cars on hand.



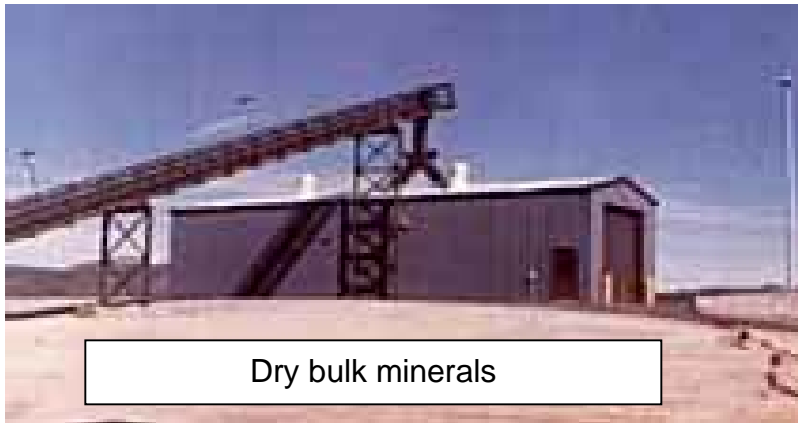
## Transload Facility and Commodity Types



Multi-purpose transload center



Liquid Asphalt



Dry bulk minerals



Wallboard & Building Materials



## Transload Facility and Commodity Types



Paper & Newsprint



Coil steel



Plastic pellets



Scrap metal

## Transload Facility and Commodity Types



## Rail unit trains are the lowest cost option

- Rail unit trains handle a large number of railcars moving between a specific origin and destination on a repetitive round-trip basis
  - Example: coal moving from the mine to a power generating plant in a 100-car train
  - Example: grain moving from country to terminal grain elevators
- Because the fixed cost of the “train start” is spread across the large number of carloads on the train, unit cost and therefore price per carload is typically low
- Rail unit train customers enjoy the benefits gained in moving large volumes
  - Utilities are the major unit trains customers,hauling coal from mine to generating plant.
  - Large volume, repetitive moves of the same commodity between the same origin and destination
  - No special handling of the product is required
  - Relatively low service sensitivity
  - Relatively low value of commodity being transported dictates low transportation costs
  - Limited number of origin and destination pairs



## Intermodal is the railroad's premium service

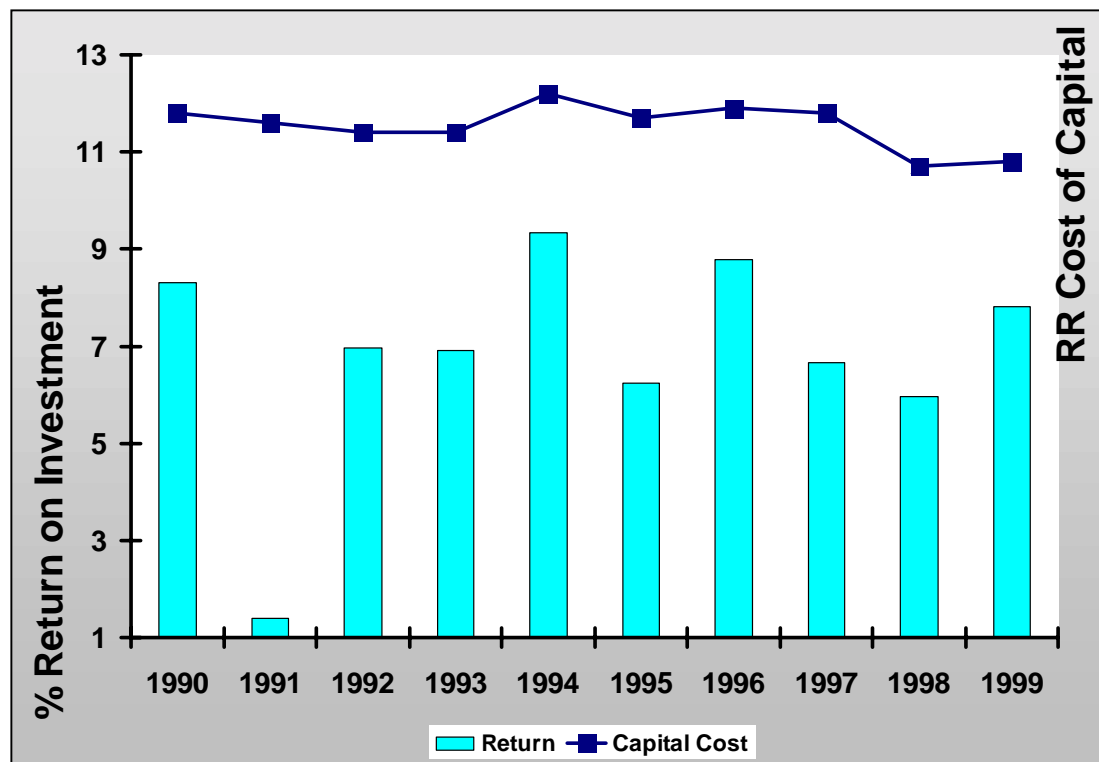
- Cargo is loaded in trailers or ocean containers and delivered by draymen to an intermodal terminal located in a major city
- The trailers and containers are loaded on rail cars
- High speed trains move the containers and trailers to terminals in a city close to its ultimate destination, where they are unloaded
- Motor carriers deliver the cargo to the shipper's dock

## Rail Industry Outlook

- Plateauing of productivity and profitability gains that can be achieved through route rationalization, systems upgrades and consolidation
- Continuing intense competition for transportation services
- Shifting consumer purchasing patterns causing shifts in the supply chain toward smaller, faster, and more reliable transportation services

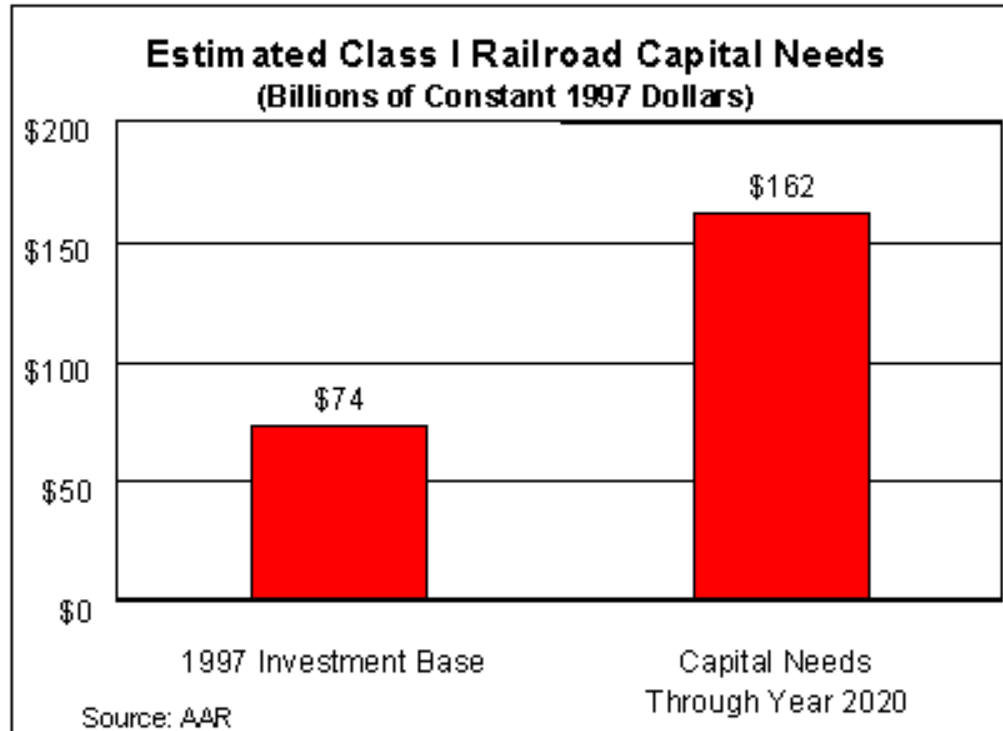
## The fundamental issue for the industry is inadequate financial performance

*Exhibit 44: Inadequate Rail Industry Financial Performance*



## Significant capital is required to maintain the status quo

**Exhibit 45: Rail Industry Capital Needs**

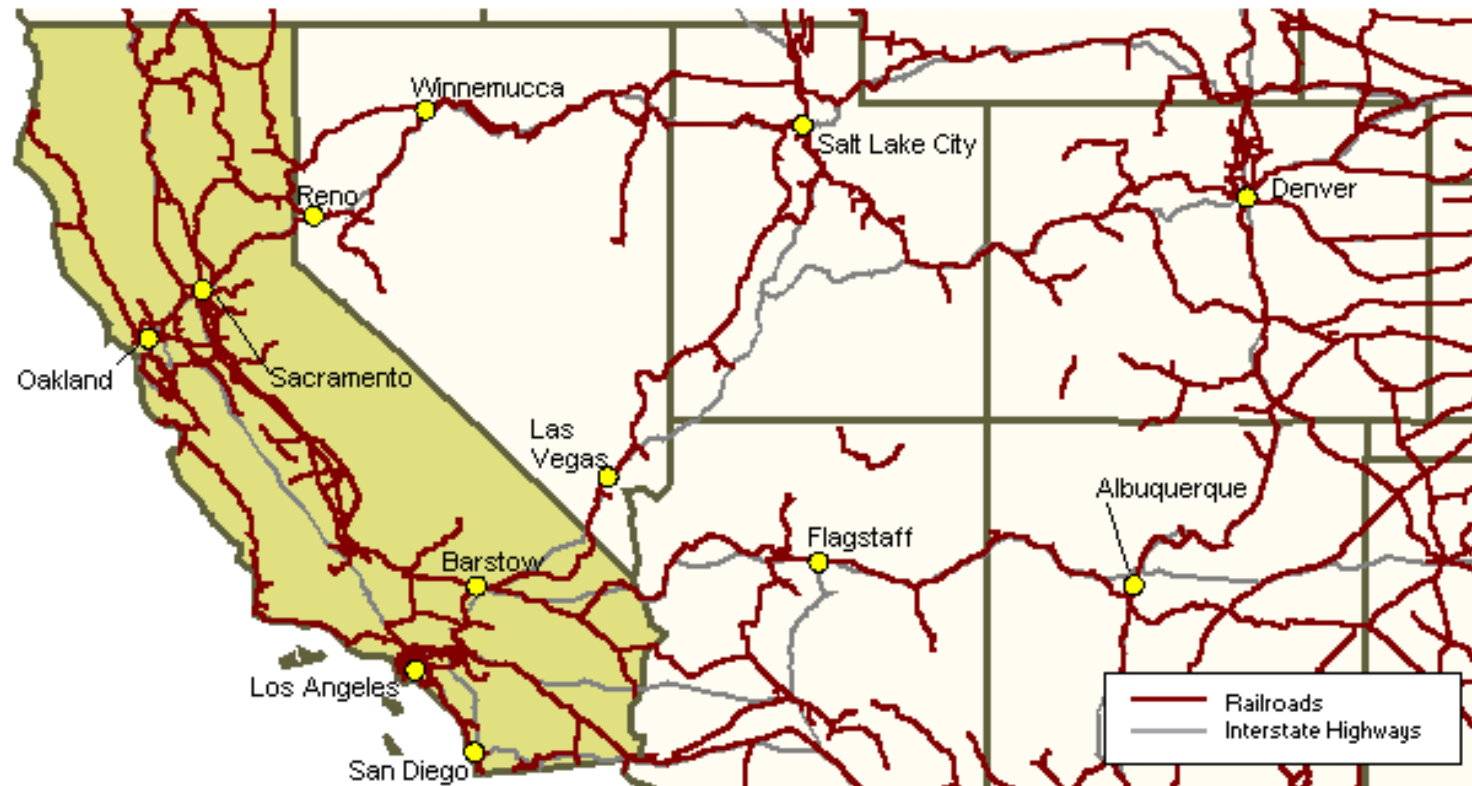


## Rail Carload Service Potential

- Increased carload rail service would reduce congestion and emissions but has practical limits.
  - Rail carload is already a low-cost mode for line-haul, but is most effective as a specialized service for appropriate commodities rather than an all-purpose mode.
  - Local switching is costly, time-consuming, and has higher emissions
  - Access to direct carload service is a major barrier
  - Current logistics practices also limit the commercial application of carload service.
- Short-haul rail service may be applicable to niche markets
  - Short-line service may be feasible in the SCAG region but faces obstacles
  - Direct carload rail service requires rail access on both ends of the movement.
  - Older, smaller industrial districts with rail access may have difficulty attracting the largest new clients.
  - Sites with rail access most often use rail carload service for bulk or semi-bulk industrial commodities, not merchandise.
  - Many newer distribution centers and manufacturing plants are built without direct rail access, limiting their use of rail carload service to transloading.
  - Adding rail access is generally impractical, with new sidings costing at least \$750,000 to \$1 million.
  - With present logistics practices emphasizing smaller shipment sizes and lower inventories, opportunities to shift truck trips to rail carload are very limited.
  - Where customers have worked with railroads to design and implement the appropriate service, results have been very good.
  - As with access, a shift to carload rail service changes logistics on both ends of the movement.

## California Railroad Infrastructure

***Exhibit 46: California Railroad Map***



Rail network based upon 1997 National Transportation Atlas Database published by the US DOT Bureau of Transportation Statistics.

## Freight Railroad Traffic in California

### *Exhibit 47: California Rail Traffic*

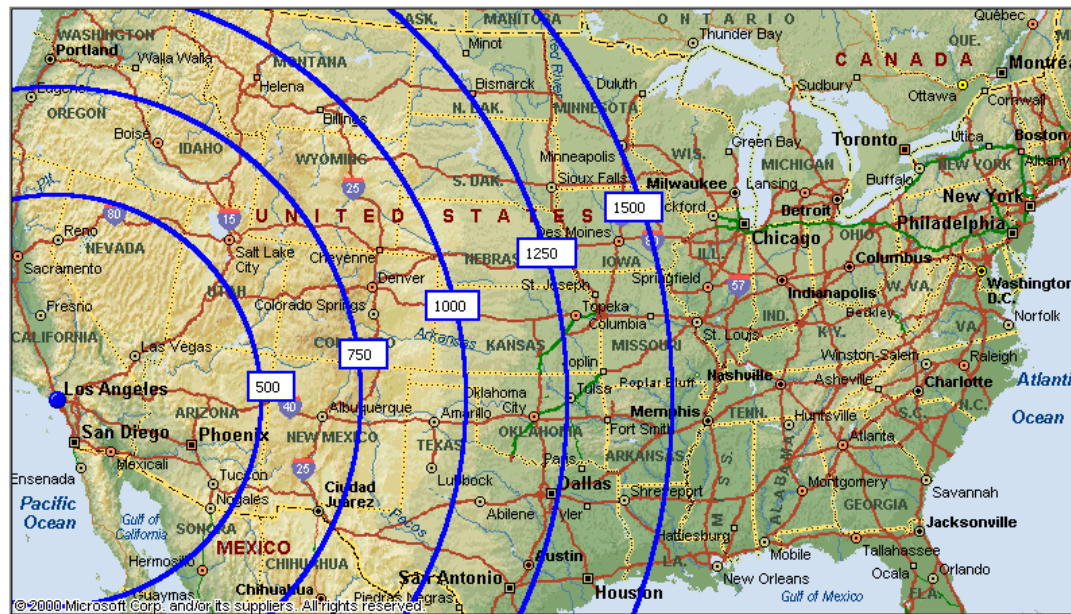
#### **Tons Originated 1999**

<b>Mixed Freight</b>	<b>24,311,415</b>	<b>44%</b>
<b>Food Products</b>	<b>5,931,412</b>	<b>11%</b>
<b>Chemicals</b>	<b>3,346,040</b>	<b>6%</b>
<b>Primary Metal Products</b>	<b>3,284,650</b>	<b>6%</b>
<b>Petroleum</b>	<b>2,454,476</b>	<b>4%</b>
<b>All Other</b>	<b>15,920,644</b>	<b>29%</b>
<b>Total</b>	<b>55,248,637</b>	<b>100%</b>

## Railroad Geography

- The pattern of rail carload traffic to and from the greater Los Angeles area (BEA 160) is determined primarily by inalterable facts of geography.
- The major California, Nevada, and Arizona markets are within 250-500 miles (encompassing Bakersfield to Tucson).
- National markets begin at about 1200 miles (Portland and beyond).
- There are no large markets between these two groups. A few smaller markets (Salt Lake City, El Paso, Albuquerque) are in the 700-900 mile range.

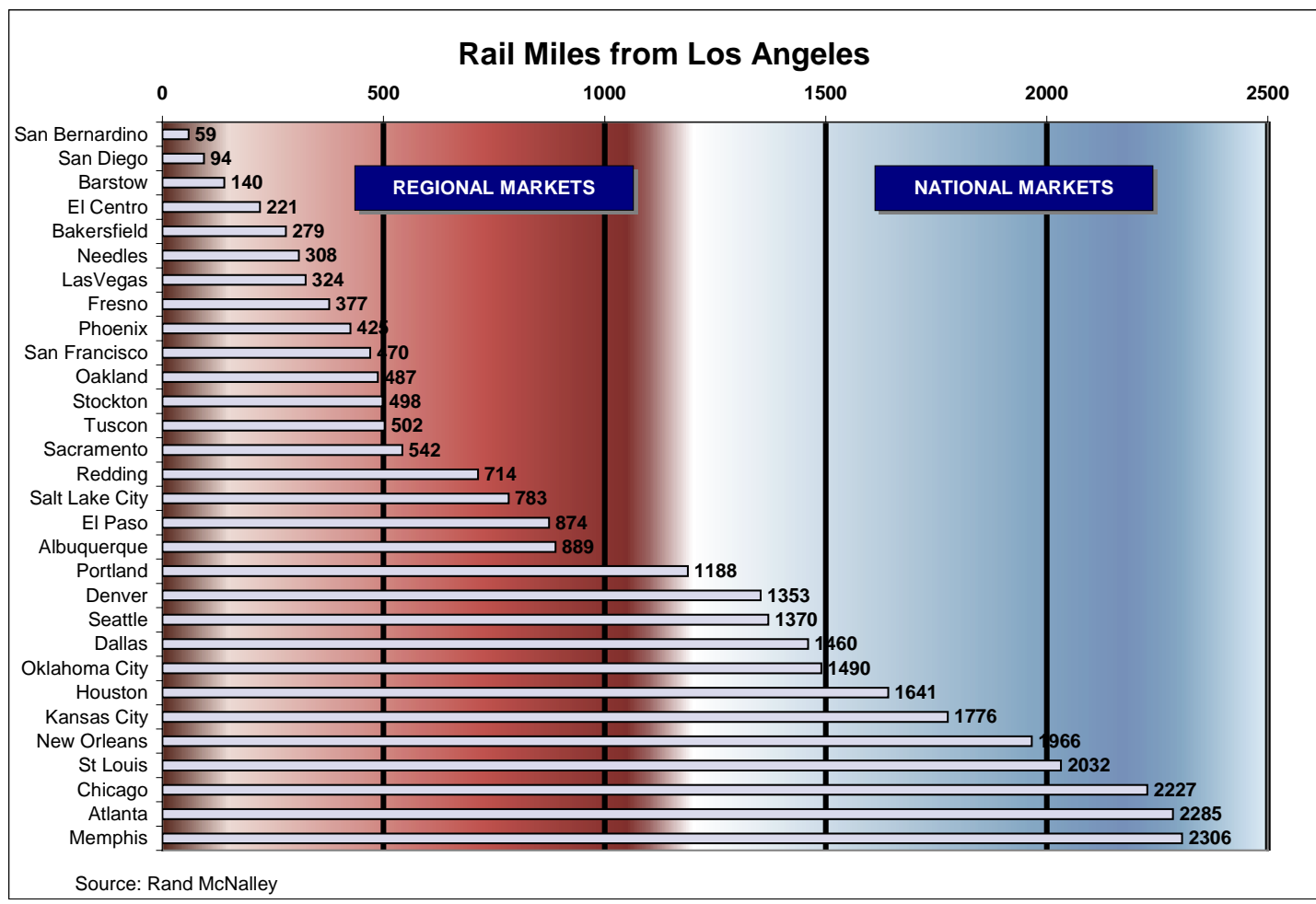
***Exhibit 48: Rail Market Geography***





## Rail Miles to Major Markets

**Exhibit 49: Rail Miles to Major Markets**



## Rail carload service data

- The Carload Waybill Sample is a statistically sophisticated annual sample of railroad records authorized by the Surface Transportation Board.
- Tioga obtained the most recent data (1999) through Caltrans.
- Data were analyzed to provide an initial profile of rail carload service to and from the Greater Los Angeles area (BEA 160).

## Freight Railroad Traffic in California

*Exhibit 50: California Rail Tons Terminated ,1999*

<b>Mixed Freight</b>	<b>21,102,220</b>	<b>24%</b>
<b>Food Products</b>	<b>8,876,928</b>	<b>10%</b>
<b>Chemicals</b>	<b>8,605,608</b>	<b>10%</b>
<b>Primary Metal Products</b>	<b>8,434,827</b>	<b>10%</b>
<b>Petroleum</b>	<b>6,524,872</b>	<b>7%</b>
<b>All Other</b>	<b>6,524,872</b>	<b>39%</b>
<b>Total</b>	<b>34,023,362</b>	<b>100%</b>

## Nature of commodities shipped by rail

Southern California producers cannot easily compete in distant markets, and firms that produce such goods in more than one region have no need to ship fungible products long distances and are less likely to be produced elsewhere

Examples could include crude oil production not accessible via pipeline and seasonal movements of sugar beets or cotton.

Bulk Commodities such as Chemicals, Cement, or Petroleum Products are heavy, produced in several regions, and transportation is a large part of the total delivered price. Thus, these products travel relatively short distances to serve nearby markets.

More specialized or valuable commodities such as Steel Products, Mineral Products, and Motor Vehicles, can support higher transportation costs. These commodities can and do move farther.

Shorter-haul traffic such as Crude Petroleum & Natural Gas and Field Crops are likely to be raw materials produced within the region and moved to processing facilities in Southern California.

## Rail carload traffic origin states

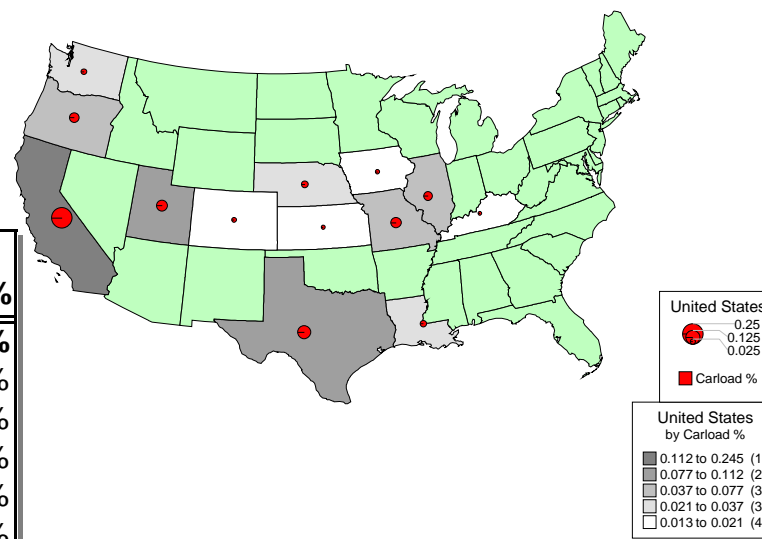
Over 80% came from west of the Mississippi

24% came from other points in California

**Exhibit 51: California Rail Traffic Origins**

Origin State	Reported Carloads	Reported Tons	Carload %	Cumulative %
<b>California</b>	<b>117,882</b>	<b>10,161,684</b>	<b>24%</b>	<b>24%</b>
Texas	53,740	4,020,257	11%	36%
Utah	39,541	4,034,505	8%	44%
Missouri	36,860	1,025,460	8%	52%
Oregon	31,220	2,455,296	6%	58%
Illinois	26,932	1,019,780	6%	64%
Nebraska	17,668	1,749,379	4%	67%
Louisiana	15,800	1,289,812	3%	71%
Washington	12,912	1,051,176	3%	73%
Colorado	9,881	978,598	2%	75%
Iowa	8,614	800,363	2%	77%
Kansas	7,140	542,932	1%	79%
Kentucky	6,480	215,080	1%	80%
All Others	96,591	6,815,082	20%	100%
<b>Total</b>	<b>481,261</b>	<b>36,159,404</b>	<b>100%</b>	<b>100%</b>

*Major Origins of So. Calif. Carload Traffic*



## Rail carload commodities received

Inbound freight is also mostly industrial products and raw materials

**Exhibit 52: California Inbound Rail Commodities**

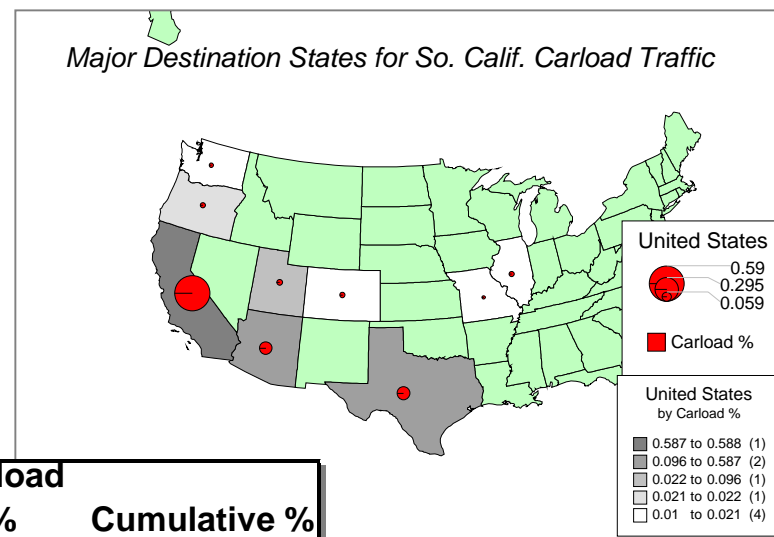
Commodity	Exp Carloads	Exp Tons	Avg. Miles	Tons %	Cumulative %
Steel Products	63,528	5,503,216	1,217	15%	15%
Coal	37,402	3,985,715	950	11%	26%
Chemicals	33,876	3,241,360	2,116	9%	35%
Field Crops	30,785	3,042,096	2,251	8%	44%
Grain Products	20,076	1,823,372	269	5%	49%
Motor Vehicles	82,000	1,809,464	1,470	5%	54%
Petroleum Products	23,544	1,762,768	1,600	5%	59%
Lumber	20,360	1,741,080	1,391	5%	63%
Paperboard	25,880	1,700,040	2,009	5%	68%
Plastics	16,680	1,559,360	1,872	4%	72%
Crude Pet. & Natural Gas	16,286	1,440,880	270	4%	76%
Paper	13,944	970,396	2,168	3%	79%
Misc. Wood Products	10,440	828,240	2,151	2%	81%
Beverages	11,272	788,668	289	2%	84%
Misc. Foods	8,332	748,332	282	2%	86%
Cement	6,756	612,200	2,527	2%	87%
Sand & Gravel	5,628	567,936	143	2%	89%
Misc. Mineral Products	5,856	560,248	2,049	2%	90%
All Others	48,616	3,474,033	1,360	10%	100%
<b>Total</b>	<b>481,261</b>	<b>36,159,404</b>	<b>1,414</b>	<b>100%</b>	<b>100%</b>

## Rail carload traffic destination states

- Most rail carload traffic originating in Southern California terminates in nearby states. Almost 60% stays in California.

**Exhibit 53: California Rail Freight Destinations**

Destination State	Reported Carloads	Reported Tons	Carload %	Cumulative %
<b>California</b>	<b>114,194</b>	<b>9,986,628</b>	<b>59%</b>	<b>59%</b>
Texas	20,092	1,122,908	10%	69%
Arizona	18,688	1,495,296	10%	79%
Utah	4,972	448,200	3%	81%
Oregon	4,248	296,928	2%	83%
Illinois	4,052	335,664	2%	85%
Colorado	4,004	276,804	2%	88%
Washington	3,096	203,732	2%	89%
Missouri	1,984	98,092	1%	90%
All Other States	19,207	1,314,966	10%	100%
<b>Total</b>	<b>194,537</b>	<b>15,579,218</b>	<b>100%</b>	<b>100%</b>



## Rail carload commodities shipped

- Nearly all Southern California rail carload tonnage is heavy bulk commodities, industrial products, or inputs to manufacturing.

***Exhibit 54: Southern California Rail Commodities Shipped***

Commodity	Exp Tons	Avg. Miles	Tons %	Cumulative %
Steel Products	4,001,932	2,133	26%	26%
Chemicals	2,711,228	544	17%	43%
Cement	1,583,012	280	10%	53%
Petroleum Products	1,333,664	236	9%	62%
Waste or Scrap	1,116,036	1,520	7%	69%
Crude Pet. & Natural Gas	823,716	111	5%	74%
Beverages	568,900	520	4%	78%
Coal & Pet. Products	529,812	188	3%	81%
Field Crops	451,568	149	3%	84%
Misc. Mineral Products	391,400	1,879	3%	87%
Motor Vehicles	261,488	1,451	2%	88%
Plastics	240,688	378	2%	90%
All Others	1,565,774	762	10%	100%
<b>Total</b>	<b>15,579,218</b>	<b>990</b>	<b>100%</b>	<b>100%</b>



## SCAG Region Carload Traffic Origins

Most SCAG region carload traffic originates in a small number of scattered industrial districts.

***Exhibit 55: SCAG Region Rail Carload Origins***



## SCAG Region Carload Traffic Origins

Carload Origins: Central L.A. (90055)

Older industrial district with rail sidings



Carload Origins: El Segundo (90245)

Refineries and liquid bulk



**Chevron Oil Refinery**

## SCAG Region Carload Traffic Origins

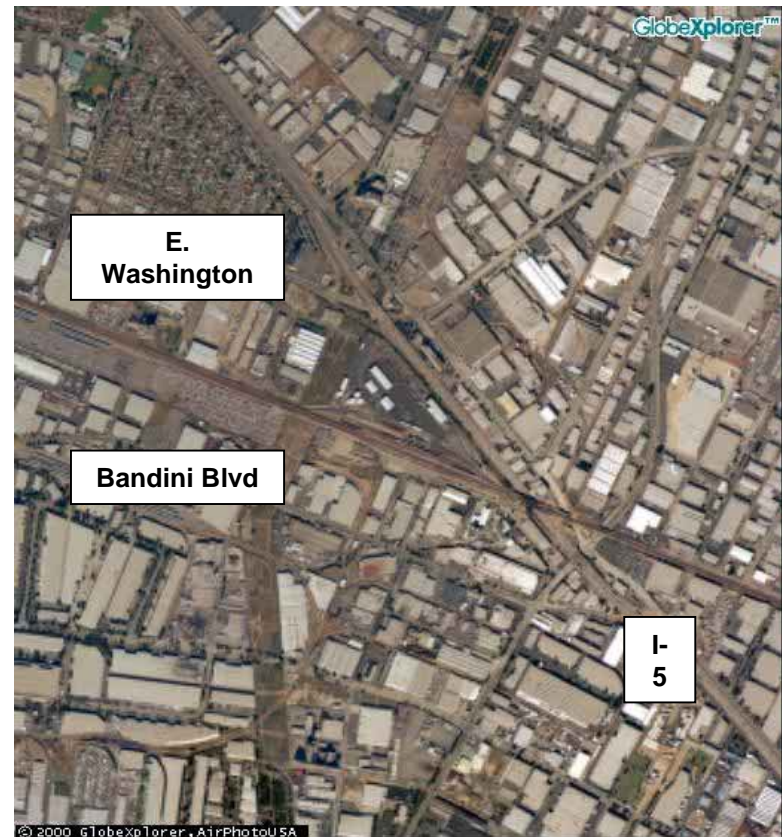
Carload Origins: Torrance (90510)

Bulk processing and industrial parks



Carload Origins: Paramount (90723)

Mixed industrial district with rail access





## SCAG Region Carload Traffic Origins

Carload Origins: Carson (90745)

Large, newer distribution centers and industrial sites with rail access.

Carload Origins: Wilmington (90748)

Refineries.



## SCAG Region Carload Traffic Origins

Carload Origins: Long Beach (90801)

Petroleum products, bulks, autos.



Carload Origins: North Hollywood (91603)

Older industrial area.





## SCAG Region Carload Traffic Origins

Carload Origins: Walnut (91789)

Major new distribution centers and industrial sites with rail access.



Carload Origins: Colton (92235)

Outlying industrial area along rail route.



## SCAG Region Carload Traffic Origins

Carload Origins: Fontana (92324)

Major Inland Empire industry.

